CLAIMS

1. An enzyme-based monitoring device for monitoring the thermal impact of thermal processing on an object within a temperature range from 80°C to 160°C, said device comprising a container containing at least one enzyme and at least one barrier, characterized in that:
   - said container is a hermetically sealed container, and
   - said container encloses a solid dehydrated mix comprising said at least one enzyme and at least one first filler, wherein the water content of said dehydrated mix is below 0.6 by weight, hermetic sealing of the hermetically sealed container being obtained by means of said at least one barrier in order to prevent entry of moisture into said container .

2. An enzyme-based monitoring device according to claim 1, characterized in that said at least one enzyme represents between 0.001 and 10% by weight, of the solid dehydrated mix enclosed in said hermetically sealed container.

3. An enzyme-based monitoring device according to claim 1 or claim 2, characterized in that said at least one first filler represents between 90 and 99.999 % by weight of the solid dehydrated mix enclosed in said hermetically sealed container.

4. An enzyme-based monitoring device according to any of claims 1 to 3, characterized in that said at least one first filler is a non-porous filler.

5. An enzyme-based monitoring device according to any of claims 1 to 4, characterized in that said at least one first filler is an inorganic filler.

6. An enzyme-based monitoring device according to any of claims 1 to 5, characterized in that said at least one first filler is selected from the group consisting of glass beads, metal beads and silica beads.

7. An enzyme-based monitoring device according to any of claims 1 to 6, characterized in that said at least one first filler is an organic filler.

8. An enzyme-based monitoring device according to any of claims 1 to 7, characterized in that said at least one first filler consists of polymer beads.

9. An enzyme-based monitoring device according to any of claims 1 to 8, characterized in that said first filler consists of beads with an average size below about 0.3 mm.

10. An enzyme-based monitoring device according to any of claims 1 to 9, characterized in that said solid dehydrated mix further comprises at least one second filler.

11. An enzyme-based monitoring device according to claim 10, characterized in that said at least one second filler represents up to 10 %, preferably up to 5%, by weight of the solid dehydrated mix enclosed in said hermetically sealed container.

12. An enzyme-based monitoring device according to claim 10 or claim 11, characterized in that said at least one second filler is a water-soluble filler.

13. An enzyme-based monitoring device according to any of claims 10 to 12, characterized in that said at least one second filler is an organic filler.

14. An enzyme-based monitoring device according to any of claims 10 to 13, characterized in that said at least one second filler is selected from the group consisting of polyols and carbohydrates.

15. An enzyme-based monitoring device according to any of claims 10 to 12, characterized in that said at least one second filler is an inorganic filler.

16. An enzyme-based monitoring device according to claim 15, characterized in that said at least one second filler is selected from the group consisting of alkali and alkaline-earth metal salts.

17. An enzyme-based monitoring device according to any of claims 1 to 16, characterized in that said at least one enzyme is from bacterial, vegetal, animal or fungal origin.

18. An enzyme-based monitoring device according to any of claims 1 to 17, characterized in that said at least one enzyme is a bacterial α-amylase.

19. An enzyme-based monitoring device according to any of claims 1 to 17, characterized in that said at least one enzyme is a pectin methyl esterase.

20. An enzyme-based monitoring device according to any of claims 1 to 19, characterized in that the amount of said at least one enzyme in said device is below about 3 mg.

21. An enzyme-based monitoring device according to any of claims 1 to 20, characterized in that said hermetically sealed container is made from one or more moisture-impermeable materials selected from the group consisting of glass, silica, metals and polymers.

22. An enzyme-based monitoring device according to any of claims 1 to 21, characterized in that said hermetically sealed container is made from one or more layers.

23. Use of a solid dehydrated mix comprising at least one enzyme and at least one first filler, wherein the water content of said dehydrated mix is below 0.6% by weight, as a bio-integrator for monitoring the thermal processing of an object within a temperature range from 80°C to 160°C.

24. Use according to claim 23, wherein said object is in a particulate form.

25. Use according to claim 23 or claim 24, wherein said object is human or animal food.

26. Use according to claim 23, wherein said object is a medical tool or device.

27. Use according to claim 23, wherein said object is a pharmaceutical composition in the form of a liquid, syrup, cream or paste.

28. Use according to any of claims 23 to 27, wherein monitoring is based on residual enzymatic activity after said thermal processing.

29. Use according to any of claims 23 to 28, in the form of a process step in a pasteurization or sterilization process.

30. Use according to any of claims 23 to 29, wherein said at least one enzyme represents between 0.001 and 10% by weight, of said solid dehydrated mix.

31. Use according to any of claims 23 to 30, wherein said at least one first filler represents between 90 and 99.999 % by weight of said solid dehydrated mix.

32. Use according to any of claims 23 to 31, wherein said at least one first filler is a non-porous filler.

33. Use according to any of claims 23 to 32, wherein said at least one first filler is an inorganic filler.

34. Use according to any of claims 23 to 33, wherein said at least one first filler is selected from the group consisting of glass beads, metal beads and silica beads.

35. Use according to any of claims 23 to 32, wherein said at least one first filler is an organic filler.

36. Use according to any of claims 23 to 32, wherein said at least one first filler consists of polymer beads.

37. Use according to any of claims 23 to 36, wherein said first filler consists of beads with an average size below about 0.3 mm.

38. Use according to any of claims 23 to 37, wherein said solid dehydrated mix further comprises at least one second filler.

39. Use according to claim 38, wherein said at least one second filler represents up to 10 %, preferably up to 5%, by weight of said solid dehydrated mix.

40. Use according to claim 38 or claim 39, wherein said at least one second filler is a water-soluble filler.

41. Use according to any of claims 38 to 40, wherein said at least one second filler is an organic filler.

42. Use according to any of claims 38 to 41, wherein said at least one second filler is selected from the group consisting of polyols and carbohydrates.

43. Use according to any of claims 38 to 40, wherein said at least one second filler is an inorganic filler.

44. Use according to any of claims 38 to 40, wherein said at least one second filler is selected from the group consisting of alkali and alkaline-earth metal salts.

45. Use according to any of claims 23 to 44, wherein said at least one enzyme is from bacterial, vegetal, animal or fungal origin.

46. Use according to any of claims 23 to 45, wherein said at least one enzyme is a bacterial α-amylase.

47. Use according to any of claims 23 to 45, wherein said **at least one enzyme** is a pectin methyl esterase.

48. Use according to any of claims 23 to 47, wherein the amount of said at least one enzyme in the solid dehydrated mix is below about 3 mg.

49. Use according to any of claims 23 to 48, wherein said solid dehydrated mix is enclosed in a hermetically sealed container.

50. A method of monitoring the thermal impact of thermal processing on an object by means of an enzyme-based monitoring device, said device comprising a container containing at least one enzyme and at least one barrier, said method comprising the steps of:

(a) placing said enzyme-based monitoring device in contact with said object or in the neighbourhood of said object;

(b) exposing said object and said enzyme-based monitoring device to thermal processing at a temperature within a range from 80°C to 160°C for

sufficient time for degrading a substantial portion of said at least one enzyme without breaking said at least one barrier of said container;

(c) removing said container from contact with said object or from the neighbourhood of said object after completion of step (b);

characterised in that :

- said container is a hermetically sealed container,
- said container encloses a solid dehydrated mix comprising said at least one enzyme and at least one first filler, wherein the water content of said dehydrated mix is below 0.6% by weight, hermetic sealing of the hermetically sealed container being obtained by means of said at least one barrier in order to prevent entry of moisture into said container during thermal processing of said object; and
- said method further comprises the steps of:

(d) opening said hermetically sealed container and obtaining a sample of the at least one enzyme from said hermetically sealed container;

(e) measuring the residual activity of said at least one enzyme in the obtained sample, and

(f) using the measured residual activity as a means to quantify the thermal impact of the thermal processing of step (b) on one or more given target attributes of said object.

51. A method of monitoring the thermal impact of thermal processing on an object according to claim 50, characterized in that :

- in step (d), a sample of said at least one enzyme enclosed in said hermetically sealed container is obtained in the form of an enzyme solution by solubilizing in or more solvents the fraction of said solid dehydrated mix comprising said at least one enzyme, and
- in step (e) said enzyme solution is put into contact with a substrate for said at least one enzyme, resulting in a product, and measuring the residual activity of said at least one enzyme is effected by quantifying the rate of formation of said product.

52. A method of monitoring the thermal impact of thermal processing on an object according to claim 50 or claim 51, characterized in that said given target attribute of said object being quantified in step (f) is a chemical, physical, organoleptic or microbiological property of said object.

53. A method of monitoring the thermal impact of thermal processing on an object according to any of claims 50 to 52, wherein said object is human or animal food.

54. A method of monitoring the thermal impact of thermal processing on an object according to any of claims 50 to 52, wherein said object is a medical tool or device.

55. A method of monitoring the thermal impact of thermal processing on an object according to any of claims 50 to 52, wherein said object is a pharmaceutical composition in the form of a liquid, syrup, cream or paste.

56. A method of monitoring the thermal impact of thermal processing on an object according to any of claims 50 to 55, wherein said thermal processing is part of a pasteurization or sterilization process.

57. A method of monitoring the thermal impact of thermal processing on an object according to any of claims 50 to 56, wherein said at least one enzyme represents between 0.001 and 10% by weight, of said solid dehydrated mix.